DOCUMENT RESUME

ED 105 974 PS 007 815

| | |
|---|---|
| AUTHOR | Rebecca, Meda; And Others |
| TITLE | Relationships Between Creativity and Field Dependence-Independence in Fourth Grade Children. Developmental Program Report No. 40. |
| INSTITUTION | Michigan Univ., Ann Arbor. Dept. of Psychology. |
| PUB DATE | May 74 |
| NOTE | 28p.; For other reports of the Developmental Program, see PS 007 814-820 |
| AVAILABLE FROM | Department of Psychology, University of Michigan, Ann Arbor, Michigan 48104 (Report No. 40, $0.25) |
| EDRS PRICE | MF-$0.76 HC-$1.95 PLUS POSTAGE |
| DESCRIPTORS | Cognitive Processes; *Creative Thinking; *Creativity; Creativity Tests; *Elementary Education; Grade 4; Intelligence Quotient; Intelligence Tests; *Locus of Control; Perception Tests; Pictorial Stimuli; *Sex Differences; Task Analysis; Verbal Ability; Verbal Stimuli |
| IDENTIFIERS | *Cognitive Style; Field Dependence Independence |

ABSTRACT

The relation between field independence-dependence and creativity was investigated in 40 fourth graders equally divided by sex. The measures used were the Children's Embedded Figures Test, several verbal and figural subtests from the Torrance Tests of Creativity, and the Peabody Picture Vocabulary Test. No significant Pearson correlations were found between creativity measures and Embedded Figures Test scores, but a significant Kendall's coefficient of concordance indicated a low positive association between creativity and field dependence for the group as a whole. An analysis by sex suggested a possible interaction with creativity mode, in that field dependence in boys was associated with verbal creativity, and field dependence in girls with figural creativity. Creativity subscores for elaboration were more strongly and consistently related to intelligence than were scores for fluency, flexibility, or originality. (Author/CS)

ED105974

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

NOV 12 1974

# RELATIONSHIPS BETWEEN CREATIVITY AND FIELD DEPENDENCE-INDEPENDENCE IN FOURTH GRADE CHILDREN

Meda Rebecca, Joseph Torgesen, and Lorraine Nadelman

University of Michigan

PS 007815

Report #40, Developmental Program, Department of Psychology
University of Michigan, Ann Arbor, Michigan 48104, May 1974

00002/3

# RELATIONSHIPS BETWEEN CREATIVITY AND FIELD DEPENDENCE-INDEPENDENCE IN FOURTH GRADE CHILDREN

Meda Rebecca, Joseph Torgesen, and Lorraine Nadelman

University of Michigan

At the conclusion of an extensive review of the literature concerning personal factors important in the creative process, Dellas and Grier (1970) suggest that future research should be directed toward an understanding of human creativity as it relates to such constructs as cognitive styles and personality variables which are rooted within broad theoretical frameworks. Such a position represents a justifiable reaction against the plethora of atheoretical, factor-analytic studies of creativity which have identified many areas of intellectual functioning which may be related peripherally to isolated aspects of creativity, but which neither give unity to the concept of creativity as a psychological construct nor relate it to other areas of personal functioning. What is needed, then, are studies which will try to embed an individual's creative proclivities within his more general personality and cognitive structures.

The study of cognitive styles, usually defined as stable and enduring patterns of perception and cognition which determine an individual's approach to and interpretation of his environment, has become an area of rapidly expanding knowledge over the past two decades. Many different dimensions of individual differences have been related to the concept of cognitive style, and these styles have been shown to influence broadly diverse areas of personal functioning.

Perhaps the most thoroughly and systematically investigated of the concepts which fall in the general category of cognitive style are the "field dependent" and "field independent" styles discussed by Witkin and his associates

(Witkin, Dyk, Faterson, Goodenough, & Karp, 1962). This work started with the identification of individual differences in the ways in which people orient themselves in space (Witkin, 1950) and has led to a theory of individual differences covering broadly diverse areas of cognitive and affective life.

A perceptual task which is used to differentiate individuals with regard to the field dependence-independence dimension involves the ability to discriminate a single item from within an embedding context (Karp, 1963). Because of relationships which were subsequently discovered between perceptual field dependence-independence and other modes of intellectual functioning (Witkin, et al., 1962) field dependence-independence is currently believed to be the perceptual component of a more general "analytic versus global" cognitive style.

Wertheimer (1945) may have been the first theorist to provide a rationale for possible linkages between creative activity and a field independent cognitive style. His idea, that many problems which call for a creative solution often demand the break up of a complex stimulus array so that the parts may be recombined in new relationships, implied that a field independent style would be an advantage in some aspects of the creative process. In his general theory of creativity, C. R. Rogers (1953) maintained that a creative approach to experience and knowledge was dependent in part upon an internal locus of evaluation for both self and activities. This trait has been shown to be more characteristic of the field independent person than those classified as field dependent. Finally, MacKinnon (1962) provided yet another positive link between the two modes of functioning at issue here. On the basis of both theoretical and empirical considerations, he maintained that "what seems to characterize the creative person... is a relative absence of repression and suppression as mechanisms for the control of impulse and imagery. Repression operates against creativity...because it makes unavailable to the individual large aspects of his experience (p.16)." The use of repression and denial, in contrast to the more specialized defenses of

isolation and intellectualization, are most often associated with the field dependent cognitive style.

With the abundant theoretical links which make a relationship between field independence and creativity plausible, it is surprising that there are so few studies which have attempted to examine this relationship directly. Of the few studies which do fall into this last category, only one (Spotts & Mackler, 1967) has found clear indications that such a relationship exists. These investigators, using adult subjects, found that field independent individuals consistently scored higher on a series of creativity measures than field dependent subjects. One other study with adult subjects (Bloomberg, 1971) found no definite relationship between the two constructs, while a study by MacWhinnie (1967) obtained marginally significant correlations between two creativity scores and Embedded Figures Test performance for sixth grade children.

The purpose of the present study is to investigate the relationship between field independence and creativity in young children. Most of the evidence presented thus far is based upon experiments conducted with adults. Although creative products may show some of the same characteristics across all ages, it is much less certain that the same processes are involved in creative productivity for both children and adults. While some studies have shown that creative children have the same general personality characteristics as creative adults (Drevdahl, 1956; Holland, 1961; Parloff & Datha, 1965; Rees & Goldman, 1961), the actual ties between these personality variables and creative processes are very often unclear. Analytic cognitive style, on the other hand, has rich theoretical ties to many of the personality characteristics and intellectual abilities which are most often seen as necessary to the creative process. Thus, if the relationship between field independence and creativity can be established for young children, this will be an important step in establishing a process link between childhood and adult creativeness. The psychometric implications

of such a link derive from the fact that individual differences in degree of field independence have been shown to be one of the "most powerful continuities in the domain of human development" (Kagan & Kogan, 1970, p. 1325). The first hypothesis of the present study, therefore, is that there will be a positive relationship between creativity scores on several measures of creativity and field independence as measured by the Children's Embedded Figures Test.

Because several studies (Crandall & Sinkeldam, 1964; Wachtel, 1968) indicate that the relationship between field independence and other psychological variables may be mediated by their common relationship to general intelligence, the present study employed a control for IQ. The inclusion of a control for intelligence in the present study also provides an opportunity to test an hypothesis proposed by Wallach (1970) with regard to the Torrance Test of Creativity. He suggested that the Torrance tests are often found to relate significantly to intelligence test scores because of the inclusion of two creativity subscores for spontaneous flexibility and elaboration which actually measure convergent abilities. It is Wallach's hypothesis, and the one adopted in this study, that the subscores for flexibility and elaboration will relate significantly to verbal intelligence, while those for fluency and originality will be orthogonal with intelligence.

In addition to controlling for intelligence, the present study also used both male and female subjects so that possible sex differences in both variables separately as well as in their relationship could be examined.

Goodenough and Eagle (1963) reported findings suggesting that the ability required for a field independent perceptual approach increases from age five to age eight; however, they reported no significant sex differences in field independence-dependence at ages five and eight. Kagan and Kogan (1970) and Maccoby (1966) concluded that males above age eight are more field independent than females of comparable ages. Kagan, Moss, and Sigel (1963) suggested that

cognitive functioning may be more rigidly and earlier established in girls than in boys, which would lead to sex differences favoring boys and men on creativity tests. Torrance (1963) reported various developmental trends in creativity. He noted a steady incline from first to third grade, boys becoming increasingly superior to girls. There was a dip in the fourth grade and a spurt, particularly for girls, between fourth and fifth grade. Maccoby (1966), in a thorough review of the literature on sex differences, noted that each sex is superior to the other on creativity tasks when dealing with sex appropriate toys until third grade, after which boys are superior regardless of the "gender" of the toy. She noted that in creativity tasks involving a perceptual component, where the emphasis is on the ability to break set or restructure a problem, boys and men tend to excel, whereas girls and women are superior (although not as consistently) in more verbal divergent thinking activities.

It is to be expected, on the basis of the foregoing, that:

1. Field independence in fourth grade children will be positively related to creativity scores.

2. Creativity scores for flexibility and elaboration will be more closely related to IQ than will those for originality and fluency.

3. Fourth grade boys will be more field independent than fourth grade girls.

4. Fourth grade boys will obtain higher creativity scores than fourth grade girls.

## Method

### Subjects

Forty fourth grade children, 20 girls and 20 boys, were randomly chosen from predominantly white, middle class families who lived in a suburban area of Ann Arbor, Michigan. Chronological ages of the subjects ranged from 8-10 to 10-2, with a median of 9-4.

00008

Materials

The three measures used were the Torrance Tests of Creative Thinking - Form A, the Children's Embedded Figures Test, and the Peabody Picture Vocabulary Test - Form B.

Creativity Measures. The Torrance Tests of Creative Thinking (Torrance, 1966) consist of seven verbal and three figural subtests. The activities provide materials which are interesting and challenging to children, and which "require thinking analogous to that involved in recognized creative achievements" (Torrance, 1966, p. 10). Of the verbal tests, the three that were chosen for use in this study were Product Improvement, Unusual Uses, and Just Suppose. The figural measures chosen consisted of two activities to which the children responded by drawing: the Incomplete Figures task and the Repeated Figures task. Complete instructions and rationale for the Torrance Tests of Creative Thinking can be found in the Administration and Scoring Manual for the test battery (Torrance, 1966, a,b,c).

Field independence-dependence measure. The Children's Embedded Figures Test, developed by Stephan A. Karp and Norma L. Konstadt (Witkin, Oltman, Raskin, & Karp, 1971) was chosen as a measure of field independence-dependence. The child has to find a simple figure hidden within the context of a more complex figure. This measure is particularly suited for convenient use with young children, is highly correlated with the adult Embedded Figures Test, and is considered a valid indication of field independence-dependence.

Intelligence measure. The Peabody Picture Vocabulary Test Form B (Dunn, 1959, 1965) is an estimate of the child's intelligence via his hearing vocabulary. This measure was felt to be an adequate screening device for intelligence since the population was so homogeneous that culture-bias did not present itself as a problem.

99009

Procedure

There were two experimenters, one male and one female.

Each experimenter tested 20 students equally divided by sex. The testing was accomplished in three sessions for each child, two in which the children were seen individually and one in which the children were seen in small groups of 10-11. Two separate test rooms were provided by the school for the individual sessions.

The creativity tests were given first, half of the subjects taking the verbal part first and half of the subjects taking the figural part first. A playful atmosphere was established for both creativity measures, a condition which the experimenters felt was imperative and which thus necessitated giving the more traditional measures (Children's Embedded Figures Test and Peabody Picture Vocabulary Test) at a later time. This served to minimize the test-taking set which is not conducive to establishing a creative atmosphere. To this same end, the investigators altered those parts of the instructions which referred to time limits in such a way as to reduce the anxiety usually elicited by time pressures. Time limits were, however, enforced.

Scorer reliability was established (correlations ranged from .89 to .99), and each investigator then scored one half of the tests. Detailed information about scoring method and rationale can be obtained from the Directions Manual and Scoring Guide for the three measures.

## Results

Measures of central tendency for the total group and for each sex separately were obtained (Table 1), and correlational analyses for the total group and for each sex separately were run (Table 2). The following variables were used in the analysis of the data: Children's Embedded Figures Test score; Peabody IQ; verbal and figural fluency, verbal and figural flexibility, verbal and figural originality, verbal and figural elaboration, an average verbal score

based on the sum of T-scores for the separate creativity indices, an average figural score, a total creativity score; sex of subject; and experimenter.

Insert Tables 1 and 2 about here

The Children's Embedded Figures Test score and IQ were found to be positively and significantly correlated ($r = .33$, $p < .05$), those scoring higher on the Peabody Picture Vocabulary Test being more field independent. However, field independence-dependence was not significantly correlated with any of the creativity indices.

In order to analyze further the general relationship between field independence and creativity, the subject pool was divided into field independent, field central, and field dependent groups on the basis of the Children's Embedded Figures Test scores. However, since these scores are correlated with Peabody Picture Vocabulary Test scores ($r = .33$, $p < .05$), it is possible that intelligence factors could confound the creativity differences between groups. In order to eliminate the possible influence of intelligence on the formation of the groups, they were formed so that level of intelligence was approximately equal for all three. This was done through a quartile split of the residuals derived from the regression of intelligence on Children's Embedded Figures Test scores. The means and standard deviations for Peabody IQ and field independence scores for each of the three groups are presented in Table 3. A series of *t*

Insert Table 3 about here

tests among all possible combinations of groups revealed no significant differences between groups for IQ, and significant ($p < .01$) differences between all groups for Children's Embedded Figures Test scores. It is also important to note that this grouping of subjects resulted in equal numbers of boys and girls in all groups. The 20 mean creativity scores for each group were ranked (see Table 4), and Kendall's coefficient of concordance (W) was computed.

Insert Table 4 about here

Significant similarities occurred among rankings across measures ($W = .24$,

s = 190.5, $p < .01$). Thus the total complex of scores taken together indicate high performance on the creativity measures for the field dependent group, followed by the field central, and field independent groups.

An analysis of the relation between creativity and field independence-dependence by sexes somewhat qualified the above finding. The creativity means for boys and girls separately, when grouped by field independence categories, appear in Table 5. The Kendall coefficient obtained for boys was .14 (s = 114.67)

Insert Table 5 about here

and for girls was .12 (s = 100.5), neither of which was significant (although the direction of the results was the same as for the total group, the field dependent subjects being more creative). Inspection of these data for boys and girls separately indicated that more of the relationship between field dependence and creativity was accounted for by the boys (13 of the 20 scores for boys and 10 of the 20 scores for girls were in this direction). When one examines the verbal and figural creativity scores separately, the relationships are in the direction predicted by previous studies (Maccoby, 1966). Field dependence in boys was positively associated with only two of the eight figural scores, while in girls, field dependence was positively associated with only four of the twelve verbal scores, indicating a sex of subject by creativity mode (verbal vs. figural) interaction. In other words, there was some tendency for field independent boys to score higher than field dependent boys on figural creativity tasks, and for field dependent boys to score higher than field independent boys on verbal creativity tasks. For girls, the trend was the opposite, the field independent girls scoring higher than the field dependent girls on verbal creativity tasks, and the field dependent girls scoring higher than the field independent girls on figural creativity tasks. Four Kendall's coefficients of concordance were computed in order to examine these relationships, with the data divided according to sex of subject and creativity mode. For boys, field dependence was significantly

associated with verbal creativity (W = .51, s = 146, $p < .01$), while for girls, field dependence was significantly associated with figural creativity (W = .57, s = 73.5, $p < .01$). However, the expected converse relationships (field independent girls being more creative on verbal tasks and field independent boys being more creative on figural tasks) did not reach significance. Replication is therefore necessary to confirm the existence of a possible interaction effect among sex of subject, mode of creativity (figural/verbal), and field independence-dependence.

No significant sex differences were found for the Children's Embedded Figures Test scores (Table 2). Boys did significantly better than girls on the Peabody Picture Vocabulary Test ($t = 2.80$, $p = .008$) as well as on the total verbal measure of creativity ($t = 2.29$, $p = .03$), the difference for the total creativity index not quite reaching significance. Of the figural creativity indices, only in figural elaboration was there a sex difference favoring boys ($t = 2.08$, $p = .04$).

Since IQ was significantly positively correlated with the Children's Embedded Figures Test scores and several creativity indices, and since boys did significantly better on the intelligence test than girls, analyses of covariance were performed on the data, using IQ as the covariate. With IQ as covariate, the only sex difference that remained was for the verbal originality index, with boys scoring higher than girls ($F = 4.2$; 1/37 df; $p < .05$).

The data were also examined for experimenter and sex of subject effects by an analysis of variance on the Children's Embedded Figure Test scores. The significant interaction effect ($F = 29.8$; df 1,36; $p < .01$) indicated that same-sex children performed better than opposite-sex children for each experimenter. The male experimenter's boys scored significantly higher than his girls on the Children's Embedded FiguresTest ($t = 3.04$, $p = .04$), and on the Peabody Picture Vocabulary Test ($p = .02$). No significant sex differences were

99613

found among the subjects of the female experimenter, on either test, although the direction of the differences in the Children's Embedded Figures Test was opposite that of the male experimenter.

## Discussion

The main hypothesis of the study, that field independence in fourth grade children related positively to creativity scores on the Torrance measures, is not confirmed by the results. The tendency for field dependent subjects (when sex is ignored) to score higher on creativity measures seems to run contrary to the theoretical and empirical evidence which led to the hypothesis that field independence and creativity would be positively related in fourth grade children. The possible interaction of sex, mode of creativity (figural/verbal), and field independence-dependence, tentatively suggested by our data, may offer some clarification. However, a fruitful, if speculative, explanation may lie in the motivational situation, as well.

Golann (1963) has suggested that one important function of research on creativity is to increase understanding of the various factors which can influence the measured relationships between creativity and other variables. Such information is critical because of the consistent appearance of contradictory and confusing results which has been the norm in experimental studies of creativity over the past twenty years. Measures of creativity,such as the ones used here, derive their theoretical justification from considerations of the psychological processes supposed to be important in creative activity. However, what is actually measured is not process, but product. The crucial variable in production may be motivation, and the recent attention given to motivational factors in the assessment of creativity points to a general recognition that level of motivation is central to creative productivity (Dellas & Grier, 1970).

The other variable of interest in this study, field independence-dependence, is also related to motivational constructs. While field dependence is associated

with sensitivity to motivational cues present in the social milieu (Konstadt & Forman, 1965), the field independent style relates to motivation in terms of such internal factors as a sense of personal challenge or the desire to bring order out of confusion (Witkin, et al., 1962). Since the assessment situation in the present study emphasized positive interaction between experimenter and subject, it is very possible that their greater sensitivity and responsiveness to social stimuli led the field dependent subjects to expend greater energy on the creativity tasks than the field independent children.

It seems plausible that any differences in motivation to perform which were present in the subject population would find expression most strongly in the score for fluency of response. The sheer output of responses would tend to be facilitated by a higher motivational level, while the tendencies to produce original or different responses might be less sensitive to the kind of social motivation under discussion here.

In order to provide a post hoc test of the thesis that the tendency for field dependent children to score higher on creativity was a reflection of stronger motivation to produce responses which artifactually raised all of their creativity scores, new scores for the flexibility, originality, and elaboration scoring categories were computed. This was accomplished by simply dividing each of these three scores on a given subtest by the fluency score for that test. The index which resulted represented the average value for each scoring category on each subtest. As before, means of each of these scores were computed and ranked for the field independent, field central, and field dependent groups. The Kendall coefficient results showed only very slight and non-significant ($W = .03$, $s = 19.5$) differences in the rankings assigned to each group. Thus, the creativity scores on the three creativity categories which are perhaps less susceptible to the influence of motivational differences than the fluency score are not significantly different for the three field dependence-

independence groups. This supports the speculation that the obtained group relationship between field dependence and creativity is in part a reflection of stronger motivation in field-dependent children to produce responses.

Aside from the provocative possibilities relating to motivation, as described above, it is likely that our hypothesis about the relation between field independence and creativity was too simplistic. Not only may the patterns of relationship between our two main variables differ for the two sexes (as discussed later), but it may be that the most creative individual is the one who can shift easily back and forth from field dependence to field independence. There are indications in the literature (Bloomberg, 1967; Wallach & Kogan, 1965; Kagan & Kogan, 1970) that flexibility in switching between different levels of functioning facilitates creativity. Given our data, it may be advisable in future research to consider seriously a more complex relationship between creativity and field dependence-independence.

The hypothesis that scores for spontaneous flexibility and elaboration would be more strongly related to intelligence than would those for fluency and originality received at least partial support from the results presented in Table 2. Verbal flexibility, verbal elaboration, and figural elaboration related significantly ($p < .05$) to intelligence, while none of the relationships between fluency or originality and intelligence reached significance. The lack of relationship between figural flexibility and intelligence, however, complicates the interpretation. Perhaps the tendency toward spontaneous flexibility is not unified for verbal and figural expression; but, on the other hand, these results may be due to artifactual relationships in the data. Two facts are relevant here. First, the positive relationship between verbal flexibility and intelligence is embedded within a total verbal index that relates positively to IQ ($r = .33$, $p < .05$). Thus, the requirement for verbal skills in both the IQ measure and the verbal battery of creativity tests may be artifactually

enhancing the relationship between verbal flexibility and intelligence. When this fact is taken together with the strong relationship existing between the elaboration scores and IQ for both the verbal battery and the figural battery (which does not correlate with IQ, r = .00), the possibility is suggested that it is the scoring category for elaboration alone which is more closely tied to traditional intelligence than are the other three.

The results relevant to the hypothesis that the flexibility and elaboration scores for creativity would be more strongly related to IQ than the originality and fluency scores are meaningful for the creativity-intelligence distinction. Because the elaboration score is consistently and significantly related to intelligence, it has less predictive significance apart from general intelligence than the other three kinds of creativity scores. This remains a rather academic question at present, however, because positive evidence of predictive validity for any of the scores used in the present study is both extremely scarce and difficult to interpret (Wallach, 1970). In any event, the present results are important for those investigators who are interested in developing measures of creativity which may be shown psychometrically to represent a unified dimension with meaning above and beyond the concept of general intelligence.

The expectation that the fourth grade boys would score higher on the Children's Embedded Figures Test than the girls was not confirmed by the results. However, the strong sex of subject by experimenter interaction with this test deserves some attention because of its implications for further research in the area of cognitive styles (especially if one is concerned about social influences). Of course, replication would be necessary via a more thorough study designed for this purpose (i.e., more experimenters of each sex).

The last hypothesis, that boys would obtain higher creativity scores than girls, received only partial confirmation. Although boys scored higher on verbal creativity measures, these differences were found to be accounted for

primarily by differences in intelligence in our sample. However, boys scored higher on verbal originality even with intelligence controlled.

The equivocal results regarding sex differences (or lack thereof) and differential patterns of relationships between our variables for boys and girls, raise both methodological and theoretical issues. Since many past psychological investigations used only one sex, generalizations from the results of such studies to both sexes are highly questionable. In fact, very different processes may be operating in males and females to influence the outcome. Horner (1970), for example, found that very different motivations are related to achievement in females and in males. Something similar may be occurring for creativity, as indicated by the different patterns of relationship among our variables for boys and girls. The absence of repression in cross-sex typing has been suggested by MacKinnon (Maccoby, 1966) as a characteristic of the creative and field independent individual. The correlation of cross-sex typing with intellectual abilities is stronger for women than for men, since it is contradictory for those males who are more feminine, and thus characterized by passive-dependency, to be field independent. Further investigations of the relationship to creativity and cognitive style of such phenomena as need achievement, need affiliation, sex typing, and other processes which might affect males and females differentially would help clarify these issues.

References

Bloomberg, M. An inquiry into the relationship between field independence-dependence and creativity. Journal of Psychology, 1967, 67, 127-140.

Bloomberg, M. Creativity as related to field independence and mobility. Journal of Genetic Psychology, 1971, 118, 3-12.

Crandall, V. J. & Sinkeldam, C. Children's dependent and achievement behaviors in social situations and their perceptual field dependence. Journal of Personality, 1964, 32, 1-22.

Dellas, M. & Grier, E. L. Identification of creativity: The individual. Psychological Bulletin, 1970, 73, 55-73.

Drevdahl, J. E. Factors of importance for creativity. Journal of Clinical Psychology, 1956, 12, 21-26.

Dunn, L. M. Peabody picture vocabulary test. Minneapolis: American Guidance Service, Inc., 1959.

Dunn, L. M. Expanded manual: Peabody picture vocabulary test. Minneapolis: American Guidance Service, Inc., 1965.

Golann, S. E. Psychological study of creativity. Psychological Bulletin, 1963, 60, 548-565.

Goodenough, D. R. & Eagle, C. J. A modification of the embedded-figures test for use with young children. Journal of Genetic Psychology, 1963, 103, 67-74.

Holland, J. L. Creative and academic performance among talented adolescents. Journal of Creative Behavior, 1961, 52, 136-147.

Horner, M. Femininity and successful achievement: A basic inconsistency. In J. Bardwick et al., (Eds.), Feminine personality and conflict. Belmont, Calif: Brooks/Cole, 1970.

Kagan, J. & Kogan, N. Individual variation in cognitive processes. In P. H. Mussen (Ed.), Carmichael's manual of child psychology, Vol. I. New York: Wiley, 1970. Pp. 1273-1365.

Kagan, J., Moss, H., & Sigel, I. Psychological significance of styles of conceptualization. In J. C. Wright & J. Kagan (Eds.), Basic cognitive processes in children. Monographs of the Society for Research in Child Development, 1963, 28 (2), 73-112.

Karp, S. A. Field dependence and overcoming embeddedness. Journal of Consulting Psychology, 1963, 27, 294-302.

Konstadt, N. & Forman, E. Field dependence and external directedness. Journal of Personality and Social Psychology, 1965, 1, 490-493.

Maccoby, E. E. Sex differences in intellectual functioning. In E. E. Maccoby (Ed.), The development of sex differences. Stanford, Cal.: Stanford University Press, 1966. Pp. 25-55.

MacKinnon, E. W. What makes a person creative? Saturday Review, 1962, 69, 15-17, 69.

McWhinnie, H. J. Some relationships between creativity and perception in sixth-grade children. Perceptual and Motor Skills, 1967, 25, 979-980.

Parloff, M. D. & Datta, L. E. Personality characteristics of the potentially creative scientist. Science and psychoanalysis, 1965, 8, 91-106.

Rees, M. E. & Goldman, M. Some relationships between creativity and personality. Journal of General Psychology, 1961, 65, 145-161.

Rogers, C. R. Toward a theory of creativity. Etc., 1954, 11, 249-260.

Spotts, J. V. & Mackler, B. Relationships of field-dependent and field-independent cognitive styles to creative test performance. Perceptual and Motor Skills, 1967, 24, 239-268.

00020

Torrance, E. P. Explorations in creative thinking in the early school years. In C. W. Taylor and F. Barron (Eds.), Scientific creativity: Its recognition and development. New York: Wiley, 1963.

Torrance, E. P. Torrance tests of creative thinking: Norms--technical manual. Princeton, N. J.: Personnel Press, 1966 (a).

Torrance, E. P. Torrance tests of creative thinking: Directions manual and scoring guide; verbal test, booklet A, research edition. Princeton, N. J.: Personnel Press, 1966 (b).

Torrance, E. P. Torrance tests of creative thinking: Directions manual and scoring guide; figural test, booklet A, research edition. Princeton, N. J.: Personnel Press, 1966 (c).

Wachtel, P. L. Style and capacity in analytic functioning. Journal of Personality, 1968, 36, 202-212.

Wallach, M. A. Creativity. In P. H. Mussen (Ed.), Carmichael's manual of child psychology, Vol. I. New York: John Wiley and Sons, 1970. Pp. 1211-1272.

Wallach, M. A. & Kogan, N. Modes of thinking in young children: A study of the creativity-intelligence distinction. New York: Holt, Rinehart and Winston, 1965.

Wertheimer, M. Productive thinking. New York: Harper, 1945.

Witkin, H. A. The nature and importance of individual differences in perception. Journal of Personality, 1950, 19, 1-15.

Witkin, H. A., Dyk, R. B., Paterson, H. F., Goodenough, D. R., & Karp, S. A. Psychological differentiation. New York: Wiley, 1962.

Witkin, H. A., Goodenough, D. R., & Karp, S. A. Stability of cognitive style from childhood to young adulthood. Journal of Personality and Social Psychology, 1967, 7, 291-300.

Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. A. A manual for the embedded figures tests. Palo Alto, Calif: Consulting Psychologists Press, Inc., 1971

Footnote

We wish to acknowledge, with gratitude, the cheerful cooperation of the children, teachers, and administrators of Thurston School, Ann Arbor, and to thank Scott Miller and Pat Miller for their critical readings of earlier drafts of this manuscript.

00023

Table 1

Measures of Central Tendency and Sex Comparisons for all Test Scores

| Score | Total Group (n 40) | | Boys (n 20) | | Girls (n 20) | | t | p |
|---|---|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. | | |
| Children's Embedded Figures | 18.5 | 3.2 | 19.2 | 3.0 | 18.1 | 3.4 | 1.09 | .28 |
| Peabody IQ | 115.0 | 16.8 | 121.9 | 18.8 | 108.2 | 11.2 | 2.80 | .01 |
| Verbal Fluency | 37.1 | 16.2 | 41.4 | 17.8 | 32.8 | 13.5 | 1.73 | .09 |
| Flexibility | 20.6 | 7.3 | 22.7 | 7.9 | 18.6 | 6.1 | 1.84 | .07 |
| Originality | 28.2 | 20.2 | 35.1 | 19.1 | 21.4 | 14.5 | 2.56 | .01 |
| Elaboration | 16.8 | 9.9 | 19.8 | 10.0 | 13.8 | 9.0 | 2.01 | .05 |
| Figural Fluency | 20.0 | 5.6 | 19.4 | 5.0 | 20.0 | 6.2 | .70 | .49 |
| Flexibility | 16.2 | 5.3 | 15.6 | 4.5 | 16.9 | 5.9 | .78 | .44 |
| Originality | 25.6 | 9.0 | 26.2 | 9.2 | 24.9 | 9.0 | 1.03 | .47 |
| Elaboration | 25.6 | 14.2 | 30.0 | 17.2 | 21.1 | 8.6 | 2.08 | .04 |
| Total Verbal | 50.0 | 9.0 | 53.1 | 9.6 | 46.9 | 7.3 | 2.29 | .03 |
| Total Figural | 50.0 | 8.0 | 50.4 | 8.2 | 49.5 | 7.9 | .37 | .74 |
| Total Creativity | 50.0 | 6.5 | 51.6 | 7.1 | 48.3 | 5.4 | 1.69 | .10 |

Table 2

Intercorrelations (Pearson) Among all Test Scores for the Sexes Combined (N=40)

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | CEFT | | | | | | | | | | | | |
| 2. | PPVT | .33* | | | | | | | | | | | |
| 3. | Verbal Fluency | -.05 | .18 | | | | | | | | | | |
| 4. | Flexibility | .03 | .34* | .80† | | | | | | | | | |
| 5. | Originality | -.06 | .25 | .93† | .82† | | | | | | | | |
| 6. | Elaboration | .09 | .44† | .59† | .62† | .60† | | | | | | | |
| 7. | Figural Fluency | -.06 | -.23 | .17 | .13 | .07 | -.12 | | | | | | |
| 8. | Flexibility | -.16 | -.18 | .26 | .24 | .17 | -.12 | .89† | | | | | |
| 9. | Originality | .13 | -.03 | .13 | .13 | .08 | -.03 | .77† | .70† | | | | |
| 10. | Elaboration | .08 | .42† | .08 | .24 | .15 | .37* | .15 | .13 | .36* | | | |
| 11. | Total Verbal | .01 | .33* | .93† | .91† | .94† | .79† | .07 | .15 | .09 | .24 | | |
| 12. | Total Figural | .00 | .00 | .20 | .22 | .14 | .04 | .89† | .86† | .90† | .52† | .17 | |
| 13. | Total Creativity | .00 | .22 | .77† | .77† | .74† | .56† | .60† | .63† | .62† | .48* | .80† | .73† |

*$p \leq .05$

†$p \leq .01$

00025

Table 3

Means and Standard Deviations for Peabody IQ and Children's Embedded Figures Test Scores for Field Independent, Field Central, and Field Dependent Groups

| Group | N | IQ | S.D. | CEFT | S.D. |
|---|---|---|---|---|---|
| Field Independent | 10 | 111.5 | 10.8 | 22.1 | 0.9 |
| Field Central | 20 | 116.7 | 19.2 | 18.9 | 2.0 |
| Field Dependent | 10 | 115.1 | 17.2 | 14.8 | 2.4 |

00026

Table 4

Means of Creativity Scores for Field Independent, Field Central, and Field Dependent Groups Matched for Intelligence

| Creativity Test and Score | | Field Independent | Field Central | Field Dependent |
|---|---|---|---|---|
| Product Improvement | Fluency | 9.9 | 13.6 | 14.5 |
| | Flexibility | 6.7 | 5.7 | 7.3 |
| | Originality | 8.5 | 11.8 | 15.8 |
| | Elaboration | 4.9 | 5.3 | 7.2 |
| Unusual Uses | Fluency | 13.5 | 18.2 | 14.5 |
| | Flexibility | 7.7 | 8.4 | 8.5 |
| | Originality | 8.6 | 13.4 | 9.7 |
| | Elaboration | 7.3 | 5.5 | 6.8 |
| Just Suppose | Fluency | 7.8 | 7.9 | 9.7 |
| | Flexibility | 5.5 | 6.2 | 7.0 |
| | Originality | 3.2 | 4.5 | 3.9 |
| | Elaboration | 4.6 | 4.3 | 5.3 |
| Picture Completion | Fluency | 8.0 | 8.1 | 7.8 |
| | Flexibility | 5.9 | 6.9 | 6.9 |
| | Originality | 8.6 | 9.0 | 8.8 |
| | Elaboration | 11.8 | 9.8 | 11.7 |
| Parallel Lines | Fluency | 11.6 | 11.8 | 12.6 |
| | Flexibility | 8.5 | 9.2 | 11.5 |
| | Originality | 18.8 | 16.1 | 14.2 |
| | Elaboration | 14.6 | 12.6 | 15.1 |

00027

Table 5

Mean Creativity Scores for Field Independent, Field Central, and Field Dependent Boys and Girls

| | Girls | | | Boys | | |
|---|---|---|---|---|---|---|
| Creativity Test & Score | Field Independent | Field Central | Field Dependent | Field Independent | Field Central | Field Dependent |
| Product Improvement | | | | | | |
| Fluency | 9.0 | 11.5 | 10.6 | 10.8 | 15.7 | 18.4 |
| Flexibility | 5.6 | 5.2 | 5.8 | 7.8 | 6.3 | 8.8 |
| Originality | 8.6 | 7.9 | 8.8 | 8.4 | 15.8 | 22.8 |
| Elaboration | 3.6 | 3.4 | 5.2 | 6.2 | 7.3 | 9.2 |
| Unusual Uses | | | | | | |
| Fluency | 15.4 | 16.1 | 12.2 | 11.6 | 20.2 | 16.8 |
| Flexibility | 7.8 | 8.3 | 7.6 | 7.6 | 8.6 | 9.4 |
| Originality | 8.4 | 11.3 | 7.0 | 8.8 | 15.5 | 12.4 |
| Elaboration | 6.6 | 5.9 | 6.6 | 8.0 | 5.2 | 7.0 |
| Just Suppose | | | | | | |
| Fluency | 8.0 | 7.7 | 7.0 | 7.6 | 8.2 | 12.4 |
| Flexibility | 5.8 | 5.8 | 3.6 | 5.2 | 6.6 | 10.4 |
| Originality | 2.8 | 4.3 | 1.4 | 3.6 | 4.8 | 6.4 |
| Elaboration | 3.8 | 3.9 | 3.0 | 5.4 | 4.8 | 7.6 |
| Picture Completion | | | | | | |
| Fluency | 7.0 | 8.4 | 8.4 | 9.0 | 7.9 | 7.2 |
| Flexibility | 4.8 | 6.8 | 7.6 | 7.0 | 7.0 | 6.2 |
| Originality | 6.0 | 10.0 | 10.2 | 11.2 | 8.0 | 7.4 |
| Elaboration | 7.6 | 10.5 | 7.6 | 16.0 | 9.0 | 15.8 |
| Repeated Figures | | | | | | |
| Fluency | 11.4 | 13.1 | 12.6 | 11.8 | 10.5 | 12.6 |
| Flexibility | 9.0 | 10.5 | 10.0 | 8.0 | 8.0 | 13.0 |
| Originality | 16.2 | 17.4 | 12.4 | 21.4 | 14.8 | 16.0 |
| Elaboration | 9.0 | 11.6 | 11.2 | 20.2 | 13.7 | 19.0 |